RECORDS OF THE PAST

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RECENT DATE OF LAVA FLOWS IN CALIFORNIA

THE reported discovery of the remains of man under lava deposits upon the Pacific coast gives special interest and importance to the work of the United States Geological Survey in determining the date of these eruptions. Among the most interesting is the report of Joseph S. Diller on *A Late Volcanic Eruption in Northern California.** The recent seismic disturbances in California bring before our minds those of earlier times, among the most recent of which are those of Shasta County.

Lying between the Sacramento Valley on the one side and the platform of the great interior basin on the other is the Lassen Peak district, which has been the scene of violent volcanic disturbances. The northern part of it is traversed by the Pit River, and the whole district is strongly contrasted with the surrounding country. The ridge which runs through it resulted from the accumulation of material thrown out from the earth and piled up at the point of exit. These cones, meeting at the base, form the ridge. They may be divided into 3 groups. There are 4 of the largest, and they are the most ancient; then follow those of less size and of later age, while, lastly, the smallest and youngest are the most numerous, and are spread over a wide area.

Cinder Cone, 10 miles northeast of Lassen Peak, and in the vicinity of Snag Lake, belongs to this group. The lava field from which

*Bul. U. S. Geol. Survey, No. 79, 1891.

Cinder Cone rises is an interesting spot to visit, as no better example of the two kinds of eruption can be found. It is difficult to reach, however, as the nearest stage line ends at Shingleton, Shasta County, almost 40 miles from it.

Approaching the neighborhood, a film of fine volcanic sand and small bits of dark-brown pumice are found covering everything. As we approach nearer the cone these increase in depth, until finally they give a mournful aspect to the ground and render travel increasingly difficult.

The lava field lies between Snag Lake on the south and Lake Bidwell on the north, and its greatest length is 3 miles. At first one is impressed by a sense of the recentness of the eruption. One looks in vain to see steam rising. Charred tree trunks tell a tragic story of terrible heat at no far distant day. But the closest scrutiny fails to reveal any evidence of volcanic dust that might have lodged in holes or corners, thus indicating the short length of time since the event. The cone rises to an elevation of 640 ft. above the lowest point of base (6,906 ft. above sea-level), with an average diameter of 2,000 ft. at the base and 750 ft. across the top. The slopes are very steep, the angle ranging from 30° to 70°, according to the size of the scoria and lapilli. This lapilli is of a most brilliant carmine and orange color, and proves most effective as it lies on the dull-brown background. In fact, as seen from Snag Lake, it presents quite the appearance of a most gorgeous sunset. The strangeness of the scene is increased by the absence of vegetation, only two small shrubs being seen on the slope. The base of the cone is surrounded by numberless volcanic bombs, which have evidently been hurled from the crater and have fallen down the steep slopes to the bottom. Many are small, but some few are as much as 8 ft. in diameter. They are much jointed, often radially, and are rapidly disintegrating under the influence of the elements. They present a rough, uneven surface and a low degree of crystallization.

The summit of the cone is a well-developed crater. The pit has a depth of 240 ft., with a narrow bottom and steep sides, but the most characteristic point about it is its double rim separated by a shallow ditch or moat, which encircles the mouth or rim of the funnel-shaped depression in the center.

Only the lighter matter passed out through this crater. The lava burst through the walls of the cone, coming to the surface on its southeastern side at an elevation of 6,350 ft. The upper crust of the lava tube, which was empty at the time it ceased, has broken in and been filled with ice, in marked contrast to its former temperature.

The ash field extended for a longer distance, and is seen in the vicinity of Juniper Lake, almost 8 miles from the cone. To the north it extends nearly to Poison Lake, and in the opposite direction it reaches to Hat Creek Valley, but does not extend quite to Lassen Peak.

Near the northern end of Lake Bidwell an ancient lake bed is exposed. It connects directly with the present bottom of Lake Bidwell,

TREE PUSHED OVER BY ADVANCING LAVA

Reproduced by permission of the United States Geological Survey

and it would seem that the lake in which it was laid down covered much of the space now occupied by the lava. This lake bottom is soft, white, and earthy. The thickness of the lacustrine deposit is 10 ft., and can be plainly seen in several places near the edge, showing evidently that it underlies the lava flow and rests above the earlier deposit of sand, which covers the first deposit. Another interesting fact about the lakes is the snags they contain. They are very abundant in Snag Lake, but many have rotted off, been blown down, and carried off by the water. A few are also found near the east end of Lake Bidwell.

Cinder Cone and the ash field were evidently the effect of the first explosion, and the lava field that of the second, which was more in the nature of an effusion than an explosion. The whole aspect of the lava field is that of recent formation. Some trees near the lava seem to have been scorched by the heat.

Dr. H. A. Harkness, of San Francisco, has studied the subject carefully and written concerning it. He infers, upon very insufficient evidence, that the last eruption took place in January, 1850. But careful search among the Indians and early settlers discovers no knowledge of the occurrence. Settlers who crossed the trail in 1853 report that they noticed the lonely bush now growing on the side was apparently as large then as now. There is to be seen a portion of a tree projecting from the lava. This tree was pushed over by it. There are also two other much older trees to be seen. In the case of one at least, it extends downward through the lava a distance of 10 ft. But the living trees in the neighborhood grow upon the sand which lies on top. As the stumps of the older trees decay, sand pits are formed, some of these as much as 8 ft. deep. They are numerous near the base of the cone, and extend beyond a distance of 1½ miles to the southwest.

The rings were counted on some of the recent stumps near Cinder Cone, and in some cases 200 rings were found. As there is but one season of growth and repose, these trees must have been 200 years old. So the approximate time of the earlier eruption may be arrived at, and it is evident that the second occurred at a much later date, though scarcely more than 50 years ago. One surprising thing is that pine trees usually decay in 30 years after being killed, but these have stood for 200 years. But this is probably to be accounted for by the dryness of the climate.

GEORGE FREDERICK WRIGHT.

OBERLIN, OHIO.

THE ARCHAEOLOGICAL CONGRESS AT ATHENS*

THE first International Archæological Congress was held in Athens this spring. That the place was well chosen was testified to by every speaker. The Greeks welcomed the 600 or 700 members of the Congress with enthusiasm, and bestowed on each one a medal and a card of membership, which insured many privileges. Doors were open everywhere to the fortunate possessor of card and medal; the best seats in the Stadium were theirs, and they might not only travel for half fare on all Greek railroads, and most steamers, but they might take photographs everywhere, even in museums. Blank books for notes, with sharpened pencils, and maps of Athens, were also given to the members, and many printed documents, to add to their convenience and knowledge, were distributed among them.

Not only did the University and learned men welcome the Congress, but the common people were cordial and kind, and the members of the Royal Family identified themselves with the whole movement in the heartiest manner. The Crown Prince is the leader of the Greek Archæological Society, and was President of the whole Congress, making several speeches in Greek, French and English.

It was really most interesting to see the democratic freedom with which King George, Queen Olga, and the Princes and Princesses attended meetings, drank tea, and mingled with the crowds, talking affably with every one.

On the evening of the 6th of April the University gave a reception to the learned people who had already gathered in Athens, and then was struck the dominant note of the whole Congress. This was the personal intercourse of those who had long known each other by reputation, and who were interested in the same subjects. This interchange of thought, and forming of personal acquaintance, was of greater moment than the papers read in the meetings, interesting as most of them were.

Friday, April 7, was the Greek Independence Day, and the city was joyous with flags and bells and gala observances. In the Cathedral a service was held at 11 o'clock A. M., where members of the Congress, in reserved places, beheld the gay scene, as the Royal Family took their places on a dais, and the whole diplomatic corps appeared resplendent in gold-embroidered uniforms. The Servian delegate sweltered in a chinchilla cape, and the representative of Patras created a sensation in a particularly gorgeous fustianella. The laughing and talking and crowding for place were all more in evidence than any reverence for sanctuary or service.

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*See frontispiece

In the afternoon the formal opening of the Congress took place in the Parthenon itself. The Athenian sunlight blazed down with such power on the bright dresses of the ladies and the bald heads of the learned that many took refuge in the shadow of the ruins, where they could hear no word of the speeches, but could see the golden glow of the pillars, the fleckless blue of the sky, and all the beauty of that Acropolis which is still the blossoming of the world's ideal. Even those who tried to hear the speeches, crowded up in the intense heat, could make out but little of what was said of welcome and appreciation by the Crown Prince, and the directors of the various Archæological Schools, and the distinguished visitors from abroad.

Saturday morning a general meeting was held in the University and addressed on rather general topics by the Rector, the Crown Prince, Colignon, Conze, and others. The whole Congress was then divided into 7 sections to meet in different places. This division was according to subjects, and was intended to facilitate the business of the Congress and to promote fruitful discussion. But, instead of that, the different sections, meeting often in widely separated parts of the city, rendered it difficult for members to hear the papers they especially wanted to hear, and there were so many papers for the short time given to them each day, that discussion was nearly impossible.

While the official language of the Congress was French, the papers were given in German, Greek, English, or French, according to the preference of the speakers; and there was no translation, it being understood that in the published proceedings of the Congress all the contributions would be summarized in French. The book will be interesting, but it was far more interesting to hear each theory or story of discovery with the charm of the speaker's own individuality. For instance, as Fürtwangler explained in his own convincing, enthusiastic way, with his locks all awry, the new arrangement of the figures on the pediment of the Temple of Aegina, one could not gainsay his arguments, or think of the old restoration by Thorwaldsen as right at all. It seems that Fürtwangler has found traces of attachments—bits of the feet of the old figures—that make a new restoration seem absolutely necessary.

Flinders Petrie gave a thrilling account of his new discoveries in the heart of the Sinaitic Peninsula, 5 days' journey through the desert from Suez. There he and Mrs. Flinders Petrie found old bethels, or sanctuaries (earlier than temples) of the goddess Hathor, and later temples and tombs connected with the ancient turquoise and copper mines. Inscriptions and votive offerings being found in abundance showed some of the buildings to be of the IV Dynasty, some of the XVIII and XIX. Prof. Uspensky, of the Russian Archæological Society of Constantinople, was the president of the Byzantine section, and gave a description of an illustrated octateuch found in the Seraglio library in Constantinople, and which undoubtedly belonged to the library of the Byzantine emperors. It contains, besides the remarks

of celebrated writers on the Octateuch, more than 300 exquisite miniatures, and establishes the identity of the writer Isaac Porphyrogenatus as the son of Alexis Comnenus.

Miss Jane Harrison gave an interesting explanation of the enigmatical E of Delphi, connecting it with the sacred symbol of 3 vertical lines, so common on ancient monuments. Dr. Baldwin-Brown of Edinburgh illustrated with beautiful slides (photographed from living models) his theory in regard to Greek drapery. Many people failed to hear Miss Boyd's delightful account of her discoveries in Crete because of a sudden change in the program.

Crete was naturally a subject much talked of. Dr. Evans gave a fine address which outlined the different epochs of Cretan life as shown by recent discoveries, and also the intimate connection between the Egyptian and Cretan histories. Dr. Dörpfeldt gave several of his always popular and enthusiastic expositions of work done in several places, among them one on the palaces of Crete. Assyrian and Babylonian archæology had no place in the Congress, and Egyptology had but little atention. Dr. Montelius of Sweden was one of the very interesting speakers, both on early Mycenean civilization and on the latest theories in regard to Etruscan art and chronology. Dr. Dyer of Oxford brought in a sparkle of wit in his short speech on the Treasuries at Olympia and Delphi. He considered that these so-called "treasuries" were really "club-houses" for the people of the various cities of Greece and Ionia, built that the inhabitants of these cities might have a spot where they felt specially at home when they came up to the sacred places; and also that in the robber-infested regions of Greece redress and a sort of consular protection was obtained by having such buildings devoted to the interests of each particular city. The real treasures were kept in the temples of Apollo and of Zeus, not in these treasuries. Dr. Waldstein insisted on the acceptance of Pausanias' attribution of the sculptures on the pediments at Olympia to Alcamenes and Paionios. But it would be impossible, in less space than the forthcoming volume, to tell of all the new and interesting matter brought forward by the members of the Congress. There were, besides the meetings, many social reunions and occasions which afforded the members of the Congress an opportunity of making each other's acquaintance and of meeting the Athenians. One of the most interesting of these was held at the English Archæological School, where the new library, a memorial to Francis Penrose, was formally opened in the presence of a very distinguished company. Speeches were made by Mr. MacMillan and Herr Conze of Berlin, by our own Prof. Wheeler of Columbia, and M. Homolle of the French School. The whole Royal Family were present, and the Crown Prince, in a few well-chosen words (in English) presented to the library a bust of Mr. Penrose, made by an Athenian sculptor, and the gift of the Greek Archæological Society.

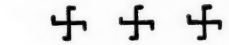
Another interesting occasion was the performance, in the Stadium, of "The Antigone of Sophocles," by a dramatic society of Athens.

The best seats were reserved for the members of the Congress, but all the thousands of spectators, crowded into the curved end of the Stadium, could hear excellently well, as was proved by the shouts of applause that met the recital of special lines. The democratic Greeks greeted such sentiments as Ismene's "To act against the will of the citizens—I cannot" with loudest cheers. The dazzling whiteness of the Pentelic marble, of which the Stadium is composed, almost blinded the spectator; but the green of the hills behind, the far blue of the sea, and of Hymettus made grateful contrast; and even the great heat of the sun could not make the spectator desire the interior of a theater, with its modern artificial settings. The blowing wind and the free sunshine and the arch of blue sky above were felt to be the only fitting environment for Sophocles' grand truths of life and fate and death.

An interesting little incident was the circulation during the Congress of printed slips of paper, presented by an Italian Countess. These papers contained a protest by a Chinaman, Mr. Tse Tsan Tai, against the removal of great works of art from their places of discovery, the taking of any relics to museums in other countries than that to which they naturally belong.

In the closing session it was decided to hold the next International Archæological Congress in Cairo, in not less than 3 or more than 5 years. Then the various members from Asia, Europe, Africa, and America scattered in all directions. Some returned to their duties as professors or excavators, some took advantage of the reduced rates on train and steamboat to visit Delphi, or Crete, or the Peloponnesus, or the cities of Asia Minor, and to see for themselves the new discoveries brought into prominence by the addresses of the Congress.

Miss Isabel Frances Dodd,
Professor of Art and Literature in the American College for Girls, Constantinople.



PARTIAL EXCAVATION OF THE N. D. McEVERS MOUND

SITUATED on a limestone bluff overlooking the Illinois River, in the town of Montezuma, Pike County, Illinois, stands the now famous N. D. McEvers Mound, not as symmetrical as it was a few weeks ago; still the greater portion of it remains intact. At the foot of the bluff, and extending east to the river, a distance of about 350 yards, is rich alluvial land, while to the north, south and west is a ridge, on which are located 12 large mounds within an area of 7 acres.

The writer was anxious to open this mound in 1904, but the owner, Mr. McEvers, objected to having this landmark defaced. However,

early this month (May) he gave his permission, and as soon as work commenced became the most interested person in the party, which consisted of Mr. McEvers, J. M. Wulfing, Dr. W. F. Parks, and myself, all having had some experience in opening mounds, all knowing a little about archæology, and all aware of the fact that 4 weeks instead of 4 days would have been necessary to have thoroughly examined this great prehistoric monument.

The mound at the time we commenced work was 28 ft. in height (possibly 33 ft. prior to the time it was first plowed) and 130 ft. in diameter.

GENERAL VIEW OF THE N. D. McEVERS MOUND, SHOWING COMMENCEMENT OF THE TUNNEL

On our first trip our two days' work proved of little value; we tunneled the mound from the west to the east, a distance of 33 ft., and opened a trench from the east to the west about the same distance, and 21 ft. in depth.

Nothing of interest was discovered other than an occasional mussel shell (some being perforated), fragments of pottery showing excellent workmanship, animal bones, ashes, and flint flakes. Too much danger was connected with this style of work, hence it was abandoned.

On our second visit we made a cut through the mound with the aid of teams, scrapers and plow, commencing 8 ft. south of the center of the mound. More or less broken pottery, shells, bones, ashes and charcoal were uncovered, and at a depth of 25 ft. an obsidian flake, 2 in. in length, a perfect spear point, 2½ in. in length, and several fragments of mica were discovered. At a depth of 26 ft. we encountered decayed wood and bark several inches in thickness. Under this layer we reached a burial crib, or cist, 7 ft. in width, east to west; 15 ft. in

length, north to south, and 20 in. in height, built of logs, undoubtedly white oak; the crevices filled with blue clay from the immediate neighborhood. Seemingly on the original surface of the ground a layer of bark had been placed, and on this, covering nearly the entire inclosure, rested 1,195 chipped leaf-shaped blades, 3½ to 6 in. in length, 3 to 4½ in. in width, every one perfect; color mostly white. There were some red ones, however, and some a mixture of black, red and white. Not a single concretionary formation was noticed in the entire lot. Some of the specimens closely resemble the Novaculite of Arkansas, so extensively quarried by the aborigines in the vicinity of Hot Springs. At the south end of the cist was found a skeleton nearly 6 ft. in length, buried face downward and head to the west; and a few

THE N. D. McEVERS MOUND, WHERE 1,195 NOVACULITE BLADES WERE FOUND

inches south of the skull were two magnificent bone awls, made from the metapodal bone of the elk, in perfect condition, 11½ and 12½ in. in length. North of the skull and 1 foot from it was found a massive lower jaw, resting on 3 pink blades, no other bones near it. Seemingly a bundle of bones was deposited in nearly the center of the cist, and on this bundle a skull, near which was found a great number of pearl and shell beads, 42 of the former, one being very large, weighing when excavated 52 grains, and still showing a beautiful luster. The 72 shell beads were from ½ to 1½ in. in length, all showing exquisite workmanship. Nearly the entire bottom of the cist was covered with human bones in a very poor state of preservation, seemingly buried promiscuously, and with them 16 large bone awls, 8 in. to 12½ in. in

length, and one 5 in. Near the north end of the cist a large shell, 12 in. in length, was taken out.

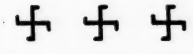
Our work on this mound is far from completion, since to date it has been confined to only the south side of what we consider the center. Again, it is yet to be determined whether or not we have reached the original surface of the mound.

This is written as a preliminary report only, and for the purpose of answering many letters received from interested parties.

Nearly everything found in this mound will be presented to the Missouri Historical Society.

DAVID I. BUSHNELL.

ST. LOUIS, MO., *May 31, 1905.*



CLIMATE AND HISTORY OF EASTERN PERSIA AND SISTAN*

IN the concluding section of this report I shall deal briefly with the main object of our expedition, to which the preceding sections have been tributary. Iran is one of the countries which will most readily furnish an answer to the question of the relation of history and physiography, for the country has been inhabited by man from remote antiquity. If man inhabited the earth during later glacial and fluvial epochs, Iran would probably have been peculiarly favorable to his development by reason of the relatively warm climate and moderate degree of rainfall which it appears to have enjoyed. A few facts bearing on this subject may indicate the line along which a solution of the problem will perhaps be found. History, archæology, and tradition all present certain features which seem to point to a greater rainfall in antiquity than at present. Physiographic evidence points in the same direction. The question is: Do the two sets of facts show points of contact, and does the same theory explain them all?

THE ANCIENT CLIMATE OF IRAN

Many writers on Iran have referred to the possibility that in antiquity the rainfall of the country was greater than now. For instance, Blanford (a, p. 500) states that "from the accounts given by ancient writers it appears highly probable that the population of Persia was much greater and cultivated land far more extensive 2,000 years ago than at present, and this may have been due to the country being more fertile in consequence of the rainfall being greater. Some alteration may be due to the extirpation of trees and bushes, the consequent destruction of soil, and increased evaporation; but this alone will scarcely account for the change which has taken place." Sykes (p. 364) expresses the same opinion: "Alexander's march with a large army and a huge camp tends to show that Asia was, in his day, not so arid as at present, and it would seem possible that in a sense my observations in Sistan support this contention." In various places he elaborates this view and presents other evi-

*Reprinted from *Explorations in Turkestan.* By the courtesy of The Carnegie Institution of Washington.

dence. The Rakshan Valley, for instance (pp. 234-235), in western Baluchistan, 300 miles southeast of Sistan, is a stream of exceedingly salt water flowing in a wide, shallow valley and discharging into the Mashkel River. The marches up this valley were "intensely monotonous, day succeeding day without a sign of life being anywhere visible, yet we could interest ourselves by speculating on the causes that had swept away the population from this valley, which for mile after mile was carefully terraced, while here and there were mounds littered with pottery. War, no doubt, has had much to do with it, but even more probably ruthless deforestation in this and adjacent districts had decreased the rainfall, after which the springs dried up and the population was driven away."

Holdich, speaking of the swamp of Mashkel, which lies in the same part of Baluchistan, but a hundred miles nearer to Sistan, remarks:

"This extraordinary abundance of water locally is difficult to explain. It appears to be a survival of a far more extended condition of water-supply in southern Baluchistan than now exists. There is widespread evidence of former cultivation by an elaborate system of irrigation in so many parts of southern Baluchistan, where it is vain to hope that such cultivation will ever exist again, that it seems as if some mighty change must have come over the land thus to render so much of it waterless. It may be due to forest denudation and cessation of rainfall, but, more likely, it is due to the gradual exhaustion of those subterranean sources which seem to be still prevalent in more northern districts.

In speaking of the mountains of Kharan, 100 or 200 miles east of Mashkel, in the center of northern Baluchistan, Vredenburg (p. 213) comes to a similar conclusion:

"In all the valleys round Zara there are to be seen hundreds of stone walls which are called "gorband," or "dams of the infidels." Sometimes they stretch right across the flat, pebbly floors of the great valleys, which, for want of a better name, are termed "rivers." They also occur across the entrance to most of the tributary ravines and at various heights above the main valley. The country is quite uninhabitable for want of water, and yet there is no doubt about the nature of these walls, which are similar to works erected to the present day in many regions of Baluchistan and Persia, being, in fact, nothing but terraced fields. In many cases they still hold back the soil, formerly cultivated, which has been heaped up against them. * * * The absence of any canals, the great height to which the walls are found up the tributary ravines, show that the fields were not watered by means of some general scheme of irrigation with canals deriving their supply from some reservoirs placed at a greater altitude. Perennial springs, now everywhere dried up, must have existed in all the ravines where these remains are found, which shows how much greater the rainfall must have been formerly."

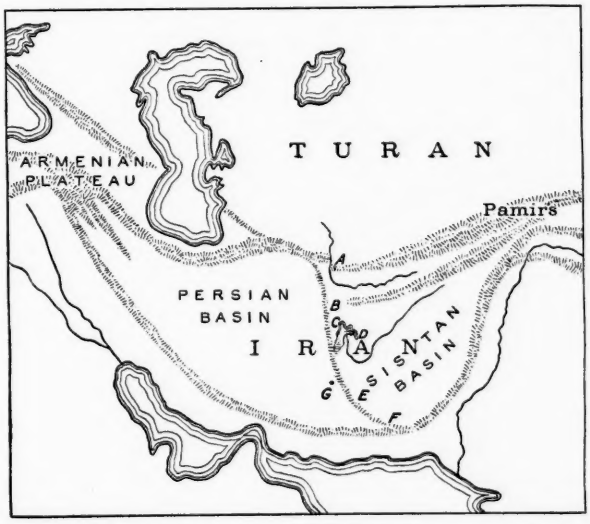
From the evidence of certain tombs Vredenburg thinks that the fields were in use even down to Mohammedan times.

ALEXANDER'S MARCH

The march of Alexander from Mesopotamia across Persia to Samarkand and the Jaxartes River, and thence via Bactria to India and back through Baluchistan to Persepolis and Babylon, is justly regarded as one of the most remarkable feats in history. There have been innumerable discussions of the subject, and the general tendency, especially of those writers who have actually traversed the more remote routes followed by the conqueror, is to think that under

present conditions the march would have been impossible. This is not the place to discuss the whole question, but a few remarks upon the portion of the journey nearest Sistan may not be out of place. When Alexander left India he divided his army of 110,000 men into two parts, one of which, including the elephants, the invalids, and the heavy baggage, was put under the command of Krateros, and followed a route through southern Afghanistan and Sistan. Alexander himself, as Sykes says (p. 169), "faced the horrors of the desert by the route along the coast of Baluchistan in order to supply his fleet by means of his army," although Arrian says it was because of his wish to rival the journeys of Semiramis and Cyrus along the same road to India.

The route which he followed is exceedingly difficult even for a small and quickly moving caravan; and for an army such as that of Alexander, which is stated to have been accompanied by women and children, the hardship must have been incredible. St. John (a, p. 75) is of the opinion that "in the early



SKETCH MAP OF THE DOUBLE BASIN OF IRAN

part of his march through Baluchistan, Alexander must * * * have been deceived by his guides, who seem to have kept him at exactly that distance from the coast where there is least water." Farther west, in southeastern Persia, conditions were scarcely better. Sykes, who is the latest authority on this region, speaks of it as follows: "During my journey from Chahbar to Ceh, in October, 1893, which was also the time that the Greek army traversed Makran (*i. e.,* southeastern Persia and southwestern Baluchistan), the temperature in the shade was generally about 100 degrees, while water was almost non-existent, and what little there was we could hardly drink (because of the salinity)" (p. 171). "Throughout the journey (from Chahbar to Kirman during the months from October to June, 1893-94) forage was our chief anxiety (although the caravan numbered only from a dozen to twenty men)" (p. 112). Among the higher mountains of this corner of Persia water can

usually be found by digging in the water-courses, although it is very poor and scarce (p. 113). Forage, however, is always hard to obtain, and (p. 123) the governors-general of the province practically never visit the district because of the scarcity of supplies. Yet Alexander must have crossed it with a large army. Northeast of Bampur, even in March, when vegetation is at its best, forage was so scarce that the governor-general, whose guest Sykes was, had had a supply stored at every stage (p. 144). "This desert stretch of more than 150 miles" along the north side of the Jaz Morain swamp was once thickly populated, as is shown by numerous ruins, and by the remnants of kanats or underground canals, to the reported number of 200, which are now dry. Many of these canals have probably been abandoned because of wars, but that does not explain how Alexander procured water for an army where there are now merely salt pools, nor how he procured forage for all his baggage animals where to-day a few score can barely subsist.

The division of Alexander's army which marched through Afghanistan under Krateros appears to have had no special difficulties, for Arrian, the historian of the expedition, merely remarks that "when Alexander arrived in Kirman, Krateros joined him, bringing the rest of the army and the elephants" (quoted by Sykes, p. 174). Apparently Krateros went via Quetta to Kandahar, and thence his route is agreed to have been down the Helmund to Sistan. So far the line of march would present no insuperable difficulties even to-day, although Bellew (p. 182), who followed the same route, relates that where the road made a detour to get around an impassable portion of the river valley, some of his men nearly died of thirst on the hot gravel plain. Beyond Sistan Krateros's route led across the southern end of the Dasht-i-Lut to Narmashir. As St. John says (a, p. 75), "it would certainly puzzle a Krateros nowadays to march his elephants and heavy baggage from the Helmund to Narmashir; but there is every reason to suppose that part of Persia to have been far better populated and better watered than it is at present." The greater part of the distance of 180 miles from the borders of Sistan to Narmashir is the most absolute desert, either waterless or supplied with the most brackish wells.

Nasratabad, the one village, could hardly give supplies for a hundred men, and everything for an army would have to be brought from Sistan. Yet the route was once so important that strong fortifications, caravanserais, and other ancient ruins occur at frequent intervals, as do also kanats, or canals. Of the last 90 miles Smith (p. 248) says that at both of the two possible stopping-places "water was obtainable by digging wells 5 ft. deep, but it was brackish and bad; and at the latter place there is a stream so salt and bitter that none of our animals would even touch it." Sykes (a, p. 417) describes the same route in equally uncomplimentary terms:

"Gurg (the first stage) is generally considered to be the worst stage in this part of the desert, the pools of water being quite undrinkable. * * * In summer, owing to the heat, Gurg is little better than a death-trap, and here, more than elsewhere, the abomination of desolation is realized. * * * At Shurgaz (the next stage) the water was just a little better, but so scanty that there was none for the camels."

At the end of the third day, after marching over a hundred miles through the worst part of the desert, a better region was reached. "A day's halt was imperative, as our camels could hardly move." That a large army could cross such a desert is hardly credible; that such an army should have no hardships

worthy of mention by the historian is less credible; and that they could bring elephants with them is least credible.

The elephants of Krateros are not the only ones mentioned in history. Malcolm (I, p. 35) speaks of them as abundant in antiquity in the kingdom of Persia, as is shown by both the ancient history and the sculpture of the country. Mazanderan is the only part of the country that could now support them, but they are spoken of in other places.

Another interesting commentary on the climate of antiquity is afforded by a comparison of a description of the province of Kirman as it is to-day, by Sykes (p. 44), and as it was in the past, by Strabo (quoted by Sykes, p. 48). The modern description runs: "The whole province can be best described as partly desert, pure and simple, and partly desert tempered by oases. * * * As may be supposed, the rivers are unimportant." The ancient description is scarcely longer, but conveys a wholly different impression: "Kirman * * * lies more to the north than Gedrosia. This is indicated by its fertility, for it not only produces everything, but the trees are of large size. * * * It is also watered by rivers. * * * It includes also a desert tract which is contiguous to Parthia." Even since the XII Century there has been a deterioration, for in numerous cases ancient Mohammedan towns are abandoned and can not be restored because no water can be procured.

THE DESICCATION OF ANCIENT RUINS

The ruins of Eastern Persia and the neighboring countries are incredibly abundant. The mighty cities of the dead crowding the shores of the lake of Sistan in the center, and the abundant vestiges of a former population much denser than the present in Kirman to the west, Baluchistan to the south, and the Helmund Valley to the east, have already been mentioned. Examples might be multiplied indefinitely, for the tale of every traveler is full of them. North of Sistan the same is true. Half way from Herat to Kandahar the plain of Dasht-i-Bakwa, where according to an Afghan prophecy, a great battle will some day take place between the English and the Russians, is now inhabited only by nomads, although this has by no means always been the case. Yate (p. 11) "found the plain covered with the marks of old karezes, or underground water-channels, and it had evidently been thickly populated by a cultivating class at some time, while water was said to be obtained all over it. When I passed it was all a waste." Ferrier, in the same region, describes the ruins of city after city. To a certain extent these might be restored to prosperity under good government, but there are certain places which no amount of government, good or bad, could affect.

NEH

The ruins of Neh, called Kala Shah Duzd, or the Castle of King Thief, illustrate this point admirably. They are located 60 miles west of the northern end of the lake of Sistan. They have been described by Sykes (p. 413), who says:

"Neh * * * is undoubtedly a site of great antiquity, and must have been a place of importance. * * * At the present time 9 routes radiate from the town. Ancient Neh * * * 3 miles to the east of the more modern fort, is built on a hill only accessible on the west side, and is carefully guarded by * * * a line of bastioned wall. * * * Lying up the steep hillside are thousands of houses, built of unhewn stone fitted together with mortar, the summit being some 600 ft. above the plain. The other faces

are perpendicular, but the water-supply seemed insufficient, there being only tanks, so far as could be seen. The area covered was quite 4 acres, and these are certainly the most important ruins which I have examined in Eastern Persia."

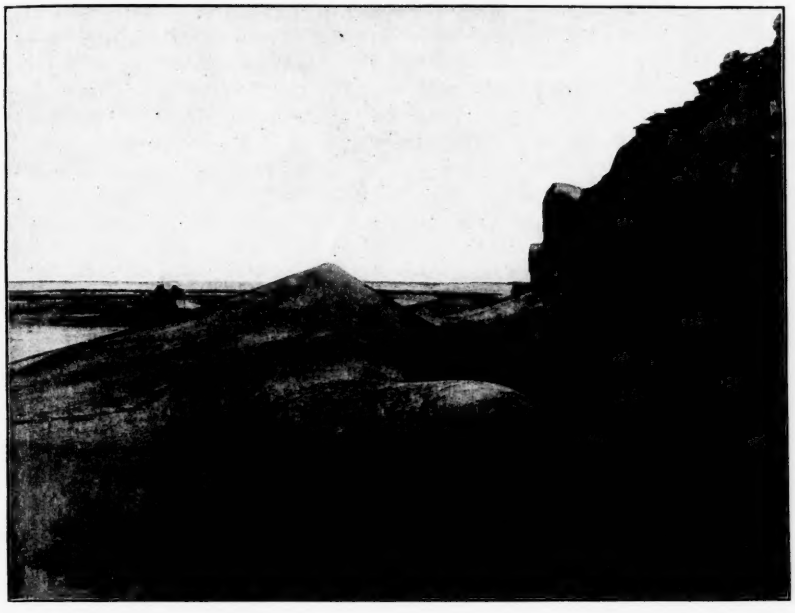
It seems to me that Sykes, who is usually very accurate, has overestimated the size and importance of the ruins. I estimated that there were at least 300 houses still standing, possibly 500, and there may have been as many more which have fallen. As to the paucity of the water-supply, these questions seem to be not whether there are cisterns enough, but how the cisterns were filled. I counted 5 large cisterns, all of them located near the top of the hill. One was located in the mouth of a small valley, where it might possibly be filled several times in the year if the drainage from among the surrounding houses were allowed to pour into it. The others were placed at the very crest of the hill, where they were not only surrounded by houses, but had only the most limited drainage areas, so that the rainfall of a whole year under present conditions would hardly fill them, even if the drainage from the streets were allowed to come in. If the place were simply a fortress we might suppose that the water was laboriously carried up the steep hill from the plain 600 or 700 ft. below and stored for time of need, although there is now no source of water within 2 or 3 miles. The number and permanence of the houses and the fact that many of them lie outside the fortifications, even though there are open spaces inside, indicate that the place was a permanent town. If the inhabitants were agriculturists, their fields must have been far away; if they were artisans and tradesmen, their number is surprisingly large in proportion to the present possibilities of the surrounding country. If the rainfall were greater, there would be no difficulty in understanding the location of Kala Shah Duzd, for the cisterns could be filled, fields could be cultivated nearby, and the surrounding plains could support villages which would warrant the building of a large fortress and town. It is not absolutely impossible that such a place should grow up under existing conditions, but it is highly improbable. Ancient Neh is one of many places which are hard to understand unless we suppose that some radical change of conditions has taken place.

THE MERV OASIS

In this connection two other places farther north in Transcaspia deserve mention. One of these is the ancient city and oasis of Merv, which I have described in a short report which will be published among the archæological reports of the Pumpelly Expedition to Turkestan for the year 1904. A study of the distribution and extent of the ruins which cover the oasis indicates that in antiquity the extent of land under cultivation and the number of inhabitants were not only greater than at present, but were greater than would at present be possible, even if all the water of the Murg-ab River, which sustains the oasis, were utilized with as much care as is employed upon the experiment station of the imperial domain. It is difficult to account for this unless the water-supply was formerly greater.

BAL KUWI AND ANAU

The other Transcaspian example is at Anau, near Askhabad. The main features of this place, both modern and ancient, will be described in the forthcoming archæological reports of the Pumpelly Expedition. At Bal Kuwi, in the desert about 10 miles north-northwest of Anau, lie the ruins of an ancient mud village. The main site consists of a mound perhaps 15 ft. high, very



LACUSTRINE BLUFFS AND RECENT SAND-DUNES NEAR SEH-KUHEH

broad and flat, and covered with bits of pottery. Where not buried in sand-dunes the surface of the mound shows the rectangular outlines of houses, the roofs of which have disappeared, while the walls have been buried to the top in the pink sand of the desert, and are thus preserved with their tops flush with the surface. Excavation shows that these houses are built without a trace of wood. On the floor of each room is a foot or two of loose clay, half of it in the form of sun-dried bricks, which appears to be the débris of the roof. Apparently the houses were made entirely of mud, with domed roofs, like those of modern Persia. The total number of houses in the main village may be estimated at from 75 to 150, while half a mile away, at Telbeng Berkoh, are 20 more of the same kind. The date of the ruins is unknown, and so far as the style of architecture and the kinds of pottery which are found in the houses are concerned, they may belong to an epoch within the last 2,000 years. The Turkoman graybeards have no tradition on the subject, and merely say that when they came to the country 50 years ago the ruins presented the same appearance as now. The inhabitants of the ruins were probably tillers of the soil, for the houses are permanent structures, and their number, at least 75, is so great that they can hardly have been occupied by a pastoral people. At present there are 3 wells at Bal Kuwi, and 20 families of Turkomans camp there for 3 months in the spring. They say that there is grass enough for 9 months, but as it gets dry they move away. Even allowing for understatement by the Turkomans, it is hardly probable that 75 and probably more families could be permanently supported by flocks in a region which the present inhabitants consider only sufficient to support 20 families 9 months out of each year. If the inhabitants of Bal Kuwi were not pastoral, they must have been

agricultural, but agriculture is to-day impossible in the neighborhood of their village. In the first place, more than half the region round about is covered with sand-dunes. In the second place, irrigation is impossible, and without irrigation agriculture is utterly impossible, as the Turkomans know to their cost. Bal Kuwi lies in the course which the Anau stream would pursue if it should be prolonged. At present, however, even in the greatest floods, when no water is taken off upstream for irrigation, the floods are lost in the desert before coming half way from Anau to Bal Kuwi. Between their point of disappearance and Bal Kuwi lie some miles of sand-dunes, through which it is evident that water never passes. In brief, Bal Kuwi appears to have been an agricultural village, but under present conditions that would be impossible. If in some way the Anau stream could be caused to increase its volume so as to flow farther out into the desert, the old condition might be restored. Bal Kuwi seems to be a parallel case to Shah Duzd and Merv, and to many other ruins in this part of the world.

THE NORTHERN BORDER OF THE DASHT-I-LUT

One more illustration will suffice to show the uniformity with which depopulation has gone on over the whole of Eastern Persia and its neighbors. Lord Curzon made a rapid journey along the high-road from Meshed to Teheran, which skirts the northern border of the great Persian desert.

"For the entire distance of 560 miles there is frequent and abundant evidence that the country traversed was once more densely or less sparsely populated, and for that reason more carefully tended, than it is at present. The traveler passes towns which have been entirely abandoned, and display only a melancholy confusion of tottering walls and fallen towers. He observes citadels and fortified posts which have crumbled into irretrievable decay and are now little more than shapeless heaps of mud. He sees long lines of choked and disused kanats, the shafts of underground wells by which water was once brought to the lands from the mountains. The walls of the cities are in ruins and exhibit yawning gaps; the few public buildings of any note are falling to pieces; rows of former dwellings have been abandoned to dust-heaps and dogs."

From other more detailed accounts of this same region it appears that the ruins are of all ages, from 2,000 to 20 years, and that the country has been subjected to a gradual process of ruin and depopulation. Practically all writers on Persia agree that in the time of Darius and as late as early Mohammedan times the country was decidedly more prosperous and more populous than now; and the area of cultivation and the visible supply of water in canals and kanats, or underground channels, were much greater.

THE CAUSE OF THE DEPOPULATION OF IRAN

Several theories have been advanced in explanation of the gradual ruin of Persia and its neighbors, but all of them can be summed up under two. According to one school, in which Curzon is the most prominent writer, the climate of Persia has remained practically unaltered throughout historical time. The decay of the country is due to wars and massacres and the frightful misgovernment which has prevailed century after century. If a strong, just government were established, the former conditions of prosperity would be restored. The progress which has been made under British rule in the arid portions of India and under Russian rule in Transcaspia shows what can be done. The other school, of which Blandford is the best-known representative, holds

that during the last 2,000 years the climate must have changed. Wars and misgovernment have been a fearful curse, but their influence is not sufficient to account for the location of large towns in places where to-day a caravan can with difficulty find a pool of brackish water. The just rule of a European power may do much in favored localities, and it would be an immense blessing everywhere; but it cannot restore the ancient prosperity.

It is not my purpose to enter into an exhaustive discussion of these two opposing views, for that would lead into a consideration of the causes of wars and migrations, the reasons for the fall of nations, and the philosophy of history. I shall merely state a few salient facts which may be put in the form of answers to the following questions: (a) Do wars and misgovernment necessarily cause permanent depopulation? (b) Are Eastern Persia and its neighbors able to support a much larger population than that which now occupies them? (c) Is there any independent evidence that the climate either has or has not changed during historical times?

(A) THE INFLUENCE OF WARS

The depopulation caused by wars is one of the best-known facts of history. The question now before us is whether, other conditions remaining unchanged, frequent wars *must* cause permanent and progressive depopulation. Examples from many lands might be quoted, but Persia itself furnishes an answer. The province of Astrabad is one of the few in Persia which are blessed with an abundant rainfall and great natural advantages. For centuries its inhabitants have been exposed to the terrible raids of the fierce Turkomans, and have also had the disadvantage of a very unhealthful climate. Their condition, as described by Vambery in the early sixties, was most pitiable. Even as late as 1880, when conditions had much improved, owing to the proximity of Russia, O'Donovan relates that murderous affrays were frequent even in the immediate vicinity of Astrabad. Yet in almost the same paragraph the author enlarges on the density of the population, Persian villages of from 20 to 30 houses being scattered every 500 or 600 yards. The fertility of the region is so great that the people persisted in coming into it, in spite of the fact that their numbers were frequently decimated by the Turkomans.

Azerbaijan, the northwestern province of Persia, furnishes a more striking example of the same sort. This, according to Curzon, "is the province which, excepting only Khorasan, has more often been violated by foreign invasion than any other part of Persia. * * * Its fertility of resources entitle it to be called the granary of Northern Iran." Tabriz, the capital, "has fallen the first victim to invading armies, and has been successively held by Arabs, Seljuks, Ottomans, Persians, and Russians. What the rage of conquest has spared, nature has interfered to destroy. The city has been desolated by frequent and calamitous earthquakes. Twice we hear of its being leveled to the ground before, in 1392, it was sacked by Timur, whose path was strewn with ruins that vied with the convulsions of nature. Five times during the last two centuries has it again been laid low. A reliable historian tells us that 80,000 persons perished in the earthquake of 1721, and we hear from another source that half that number were claimed for the death-roll by its successor in 1780." Yet, in spite of wars and calamities, the fertility of the province is such that the city of Tabriz now numbers a population of nearly 200,000 and is the commercial metropolis of Persia, while the province contains 2,000,000 inhabitants, or from 25 to 40 per square mile, according to the estimate which is put upon its area. Ruins are found in many parts of Azerbaijan, but they do not give

the impression of a country whose population and resources have steadily declined, but rather of a country which has suffered and recovered. If war and calamity are the chief causes of depopulation and the fall of nations, why has Tabriz lasted so steadily, and why is Azerbaijan so prosperous and populous?

A comparison of the 4 provinces of Khorasan, Azerbaijan, Kirman, and Sistan is suggestive. Khorasan has suffered from war more severely than any other province of Persia. Its northern portion, where the rainfall is greatest and where also the greatest amount of fighting has taken place, is to-day one of the most prosperous portions of Persia. It contains abundant ruins, but they are by no means the impressive features which they are farther south. The southern and drier part of the province is full of ruins and has suffered great depopulation. Azerbaijan, which (Curzon) has suffered from war more than any province except Khorasan, is the most prosperous and thickly populated part of Persia. The relative abundance of its water-supply renders its future hopeful. Sistan has suffered from wars, but less severely than the two preceding provinces. Nevertheless, it has been depopulated to a far greater extent. Its extreme aridity renders recovery well-nigh impossible, except along the Helmund. Kirman lies so remote behind its barrier of deserts and mountains that it has suffered from war much less than any of the 3 preceding provinces. Yet its ruined cities and its appearance of hopeless depopulation are almost as great as in Sistan. If war and misgovernment are the cause of the depopulation of Persia, it is remarkable that the two provinces which have suffered most from war and not less from misgovernment should now be most prosperous and least depopulated; while the two which suffered less from war and no more from misgovernment have been fearfully and, it would seem, irreparably depopulated. It is also significant that the regions which have suffered the greatest ruin are those where water is least abundant and a decrease in the supply would most quickly be felt. Wars and misgovernment do not seem to necessarily cause depopulation, nor has that process gone on most rapidly where war has been most prevalent.

(B) THE DENSITY OF THE POPULATION OF IRAN

It is often asserted that with proper methods of irrigation Persia might support a much larger population, and the Persians are taken to task for not utilizing their resources. The Persians, as Holdich says, of the Afghans, "have from time immemorial been great practical irrigation engineers. Every acre of rich soil is made to yield its abundance by means of every drop of water that can be extracted from underground or overground sources. It would be rash to say that the cultivable area of Afghanistan could be *largely* increased." Goldsmid, who knew Persia from end to end, was of the same opinion in regard to that country, as he shows when he speaks of the "precariousness of cultivation (in Persia as a whole), even where to many travelers fertility has appeared undeniable and of considerable extent."

The mistake of overestimating the possibilities of Persia is very common among travelers. For instance, O'Donovan describes the country between Abasabad and Mazinan, a few miles west of Sabzawar, on the road from Meshed to Teheran, as "a dreary flat, entirely uncultivated, though plentifully supplied with water from the Kal Mura River, which has left marks of extensive inundations in numerous white deposits of salt. This plain would undoubtedly produce abundant crops of rice if properly cultivated." After passing numerous ruins of fortifications, reservoirs, tanks, and other structures, "we crossed the Kal Mura, a river about 40 yards wide here and tolerably

deep, though on the maps it is usually marked as dry in summer. The country around was once extensively cultivated, as the traces of irrigating ditches show. * * * Nowadays cultivation is only attempted immediately around the towns, and even there * * * the crops are miserably poor." In June, 1880, when O'Donovan traversed this region, the Kal Mura River must have been phenomenally high, for when Smith passed this way in May, 1872, a year of very fair rainfall, with unusually good crops, he found the Kal Mura at the same place "a narrow rivulet of salt water." Apparently it was lack of water, not lack of energy, which prevented the Persians from raising O'Donovan's "abundant crops of rice."

Only a year previous to Smith's journey this very region suffered from a famine of such frightful severity that he found skeletons of men along the road where they had died of hunger, skulls of children in the very houses, 450 out of 600 shops in Nishapur closed, and the others barely able to subsist. Sebzewar was reduced from a population of 30,000 to scarcely 10,000. Everywhere death ran riot, and frequently half the people of a village perished. The famine extended with great severity over all Persia except the northwest, and is described by Goldsmid, Bellew, Smith, and St. John. For 6 years the rainfall was scanty and there was much suffering. Then came a season when the crops in many places failed almost entirely and thousands of people perished in every province. In view of the periodic return of such famines it does seem probable that Persia is capable of supporting permanently a population greatly in excess of that of to-day.

(c) INDEPENDENT EVIDENCE AS TO THE CLIMATE OF ANTIQUITY

Independent evidence as to the climate of antiquity is hard to find. It must be looked for chiefly in the forms of historical or written record, archæological record, legend, and physiographic record. The written accounts which afford evidence as to the ancient climate are scattered in numerous inaccessible volumes and have not been investigated. A few of the more prominent, such as Alexander's march and the statement of Istakhri that in the X Century the God-i-Zirrah was 100 miles long, have been mentioned. In general it is well known that ancient authors down to Mohammedan times speak of Persia in a way which implies a much greater productiveness and beauty and a much more abundant growth of trees than at present, but their statements lack the quantitative element which is necessary for a convincing solution of the question. Archæological evidence is more abundant and exact. The dams of Baluchistan, the ancient fort of Shah Duzd, the oasis of Merv, and the village of Bal Kuwi are cases where it seems as though there had been more water in earlier times. Probably a more complete study of Persian archæology will go far toward solving the problem.

LEGENDS

Legends are proverbially untrustworthy, but there is usually a solid kernel of truth in their center. Smith relates an ancient tradition common among the natives of Bajistan to the effect that the whole country around Bajistan was once covered by the sea, and that the place derives its name from two words signifying "to take toll," alluding to the toll at the ferry paid by travelers for boat-hire when the waters had partly receded. Farther east along the borders of the same playa which lies near Bajistan, "Yunsi (the Persian form of Jonah) is marked by local tradition as the spot on which the prophet Jonah was cast by the whale, and where he laid for many days concealed under a pumpkin plant." Sikyes mentions these traditions, and adds: "Again, fur-

ther east, on the Herat road, is the village of Langar, signifying an anchor, and so a port. According to M. Khanikoff, there is an ancient tradition that Langar was a harbor on the great inland sea. Although legends are as a rule far from trustworthy, yet in the two instances given it is hard to understand how they came to exist, unless there had been an inland sea at some not very remote period." Smith relates another legend which does not fit quite so well. Ja-i-Gharak is a village 20 miles south of Meshed, on the direct road to Nishapur. It is located in a mountain valley, 1,200 ft. above Meshed The name means "place of drowning," and is derived from an old tradition that the country here was once covered by the sea and that a ship foundered here. Although Smith mentions a small lake which has been artificially dammed below the village, it is hardly possible that a large lake could ever have existed here, as it may possibly have done near Bajistan, Yunsi, and Langar. It may be that the name has been transferred a few miles across the mountains from the borders of the Dasht-i-Lut, which must have been a lake if the rainfall was ever greatly in excess of that of to-day.

THE LEGENDARY HISTORY OF SISTAN

Sistan has its own crop of legends. The village of Deh Abbas Khan lies on the shore of the lake 2 or 3 miles east of Kuh-i-Khoja, and is inhabited by Sayids, who are supposed to be one of the oldest and purest Persian stocks in existence. According to their own traditions, they have inhabited the country from time immemorial, and are the descendants of the ancient Zoroastrian population. The chief of the village possesses an ancient book which has been handed down to him from many generations of ancestors and is now his dearest treasure. From this book he partly read, but mostly related to me the following traditions:

"Long, long ago all Sistan was occupied by water, a great lake, which covered not only the swamp and the site of the modern villages, but the site of Zahidan and the other ruins as well. King Suliman (Solomon) saw the lake and perceived that if it were free from water the bottom would be very good for grain and melons and all sorts of fruit. At that time there was no more rain than now, but the rivers, which came from springs in the mountains, were very much larger. Desiring to benefit mankind, King Suliman sent for his 'dhus,' huge giants, each with a single eye looking upward from the top of his head, and ordered them to reclaim the lake. Swifter than man can imagine they went to work, and, digging up earth from this side and from that, carried it on their shoulders in bags, and filled the lake. By noon the work was completed, and hence the country is sometimes called 'Nim-ruz,' or 'Half-day.' When the work was finished the 'dhus' went to the springs in the mountains and covered them, so that the water no longer came out. Since that time there has been some water in the lake, but far less than formerly.

"My ancestors, whose record is in this book, came to Sistan from Persia 1,043 years ago (A. D. 860). At that time all the villages were around Zahidan, where the ruins now are. The site of this village, Deh Abbas Khan, was under water, and only became habitable 90 years ago. It is now but very little above high-water level, and in the phenomenal flood of May, 1903, it was under water for a time."

Later I visited the ruins on the mesa of Kuh-i-Khoja with Mehemet Bey of Afzelabad, the "arbab," or chief, of the antique race of Sayids, who told me the same story with less detail. He added a few points which are worth recording. In his boyhood, 60 years ago, the water about Kuh-i-Khoja was

more abundant than now, and came from the south, from the Shila, instead of from the north, as it does to-day. The ruins of Kuh-i-Khoja are those of structures built by a king called Kaha-Kaha, by whose name they are still called. They belong to the same period as the ruins of Sabari, which are built of burned brick and lie at the bottom of what is now the main northwest bay of the lake. At that time, before the building of Zahidan, there was no water in the lake of Sistan.

As we approached the top of Kuh-i-Khoja the "arbab" stopped me, and, pointing to two small holes in the rock beside the path, remarked, "There was a spring here once, but it was closed by the Holy Man, Hazret Mehemet Ali (one of the immediate successors of Mohammed). He stepped on the spring and caused it to dry up. His heels made these holes." When I asked

RUINS AT THE MIL-I-KASIMABAD, NEAR ZAHIDAN
These mud walls are at least 500 years old

if there were other springs of the same sort, the "arbab" replied that he knew of another on the north side of Kuh-i-Khoja, a second at Bendan, called Sum-i-Duldul, and a third at Malik-Siah-Kuh, in the corner where Persia, Afghanistan, and Baluchistan meet. All 3 were closed in the same way by Hazret Mehemet Ali or by his horse. At Malik-Siah-Kuh, the "arbab" added, there was formerly a kanat, or underground water channel, but now it is dry.

From what has just been related it appears that the history of the lake of Sistan, as preserved in the traditions and written records of the ancient race of Sayids, consists of the following periods: (1) A time when water covered the area now occupied by the lake, the swamp, and the cultivated plain. (2) A time when the lake diminished in size and its shores were occupied by man. Meanwhile the size of the rivers decreased and the springs dried up. At last the lake had so entirely disappeared that the town of Sabari was built in one of the lowest parts of its bed, and Kaha-Kaha was built on what is now an island, but was then dry land. (3) Then the water returned to the lake, although the springs still continued to dry up. The city of Zahidan was built. During the days of its prosperity the lake was larger than now, and probably received its water via the Shila. (4) Last comes the modern period, the last few centuries, during which the lake has shrunk to its present size and receives all its water-supply via the delta of the Helmund.

AGREEMENT OF LEGEND, HISTORY, AND PHYSIOGRAPHY

The manner in which this traditional history agrees with the history already inferred from physiographic evidence deserves careful attention. That inferred history may be recapitulated as follows:

(1) During one of the later fluvial epochs the upper or 25-foot beach was formed and the lake probably covered the whole of the swamp and plain of Sistan and also the God-i-Zirrah.

(2) A decrease in the size of the lake ensued because of decreased rainfall or increased warmth.

(3) Next, the lake stood at the level of the lower beach, with an area greatly diminished from that of the time of the upper beach. As this is the level at which the lake overflows permanently to the God-i-Zirrah, the water may have stood here twice. The last time was probably very recent, because the bluffs left by it are so fresh that they can scarcely have existed more than a few hundred years.

(4) From this time of relatively high water the lake appears to have shrunk gradually to its present condition, as is shown by the transition from the lower of the old beaches to the present shoreline. Col. McMahon believes that the condition of the reed-beds proves this decrease in size to be still in progress.

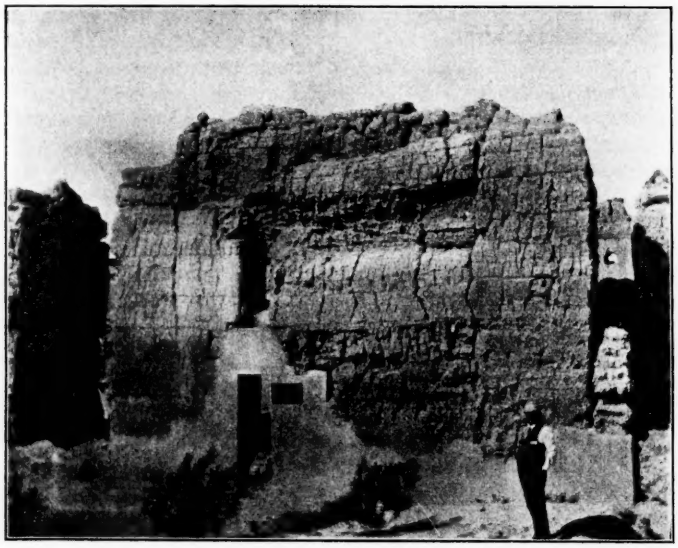
The agreement between the traditional and the physiographic history of Sistan is so close as to amount almost to identity. If we assume that they are identical, and put them together, we find that they match a third set of facts, the historical, which have already been mentioned, and a reasonable sequence of events presents itself. In this we begin with what was probably the last fluvial epoch, either when the lakes of Sistan and Zirrah were united and stood at the 25-foot beach, or more probably when the lake of Sistan stood for the first time at the 15-foot level and overflowed to Zirrah. As the fluvial epoch began to wane, springs dried up, the rivers decreased in volume, and the level of the lake fell. As the water retired, the abandoned shores were occupied by human inhabitants, who, we may suppose, began to practice irrigation at an early date. At first the largest tract of irrigable land lay along the relatively elevated neck through which runs the Shila. Accordingly the largest canals were dug in this direction. Thus it happened that the God-i-Zirrah, which was now separated from the Hamun-i-Sistan, received the greater share of water. Indeed, it is probable that practically the whole stream of the Helmund flowed to Zirrah, for Smith says that in prehistoric ages the Helmund is reported to have flowed from the dam of Kamal, where it now turns north, in a southwest direction to the lake of Zirrah and, tradition has it that Khai Khusru sailed down it in a vessel. Sykes quotes Istakhri to the effect that in his day, the X Century, the river flowed in the same way. Earlier classical writers speak of only one lake in this part of the world. It is probable that at this time Sistan was entirely dry, and the towns of Sabari, watered presumably by the Harud or Farah River, and of Kaha-Kaha, watered from the Shila, were built in what is now the lake. It is not supposed that the absence of water in the lake of Sistan indicates extreme aridity, for at this time not only was the lake of Zirrah 100 miles long, according to Istakhri, but Sistan was in its glory. At the height of its prosperity a region which, as Curzon puts it, "contains more ruined cities and habitations than are perhaps to be found within a similar space of ground anywhere in the world," must have consumed an immense amount of water in the irrigation of its fields. To furnish this and at the

same time fill the great lake of Zirrah, the rivers must have been larger than now. The limits of this period of prosperity and of abundant water-supply cannot be stated, but they seem to have included Alexander, 300 B. C., and Istakhri, 900 A. D.

Again there was a change. The bed of the lake of Sistan was once more filled with water to a height greater than that which is now reached, but less than in the previous epoch of high water, for Zahidan was not covered as it had been before. Between the time of Istakhri and the present the Helmund was diverted from a southwestward to a northward course, and this was probably the cause of the increase in the size of the lake. This is the more probable, because from historical and archæological evidence it is known that Zahidan was built soon after the time of Istakhri. To supply so large a city with water a large amount must have been withdrawn from the Helmund before it reached the God-i-Zirrah and turned in the direction of Sistan. For some centuries, until its destruction by Timur at the end of the XIV Century, Zahidan continued to flourish. It is probable that the lake stood at a high level for a considerable portion of this time, for it was able to form, or at least to rejuvenate, a well-defined shoreline, with broad beaches and high bluffs. During the last 5 centuries, since the fall of Zahidan, there has been a gradual decrease in the size of the lake and in the density of the population that surrounds it. How this could take place without a diminution in the water-supply it is hard to understand. The history of Sistan, so far as it can be made out, seems to indicate a gradual desiccation of the country from early historical times down even to the present. The evidence of archæology, history and tradition in the surrounding countries points in the same direction. At Sistan history and physiography appear to join hands, for the change from the conditions of greater water-supply during antiquity to the desiccation of to-day is apparently the change from the last fluvial epoch to the present interfluvial epoch.

ELLSWORTH HUNTINGTON.

AN ARM OF THE LAKE OF SISTAN



CASA GRANDE RUIN

Taken from Arizona Sketches, copyright, 1905, by the Grafton Press

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BOOK REVIEWS

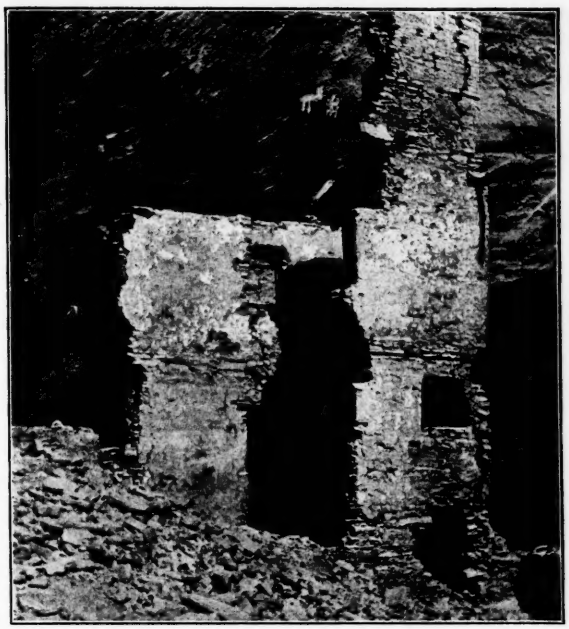
ARIZONA SKETCHES*

IN Dr. Munk's book, *Arizona Sketches,* we have a charming collection of pen pictures of Arizona life and scenery strengthened by a profusion of fine halftone views of the region and its people. He makes no attempt to solve the mystery of the origin of the present native inhabitants or what became of their predecessors. On this point he says:

When the Spaniards under Coronado first entered the land, more than 350 years ago, in search of the 7 cities of Cibola, they found upon the desert sufficient evidence of an extinct race to prove that the land was once densely populated by an agricultural and prosperous people. When or how the inhabitants disappeared is unknown and may never be known. It is even in doubt who they were, but, presumably, they were of the Aztec or Toltec race; or, perhaps, of some civilization even more remote.

**Arizona Sketches,* by Joseph A. Munk, M. D., illustrated. The Grafton Press, New York City.

The Pueblo Indians are supposed to be their descendants, but, if so, they were, when first found, as ignorant of their ancestors as they were of their discoverers. When questioned as to the past they could give no intelligent answers as to their antecedents, but claimed that what the white man saw was the work of Montezuma. All that is known of this ancient people is what the ruins show, as they left no written record or even tradition of their life, unless it be some inscriptions consisting of various hieroglyphics and pictographs that are found painted upon the rocks, which undobutedly have a meaning, but for lack of interpretation remain a sealed book. The deep mystery in which they are shrouded makes their history all the more interesting and gives unlimited scope for speculation.



CLIFF RUIN, CANYON DEL MUERTO

Taken from Arizona Sketches, copyright, 1905, by the Grafton Press

Like most travelers in Arizona, the author was impressed by the apparent recentness of the volcanic action in the region. That these lava flows are very recent from a geological standpoint is undoubted, but as the scale of historical time measure is vastly shorter than the geological, we may not be able to say they are very recent historically. This problem as to the approximate date of these overflows is one of the most interesting and possibly most difficult problems awaiting solution. To Mr. Munk it seemed that—

The whole region was at one time violently disturbed by seismic force, and the glow of its quenched fires has even yet scarcely faded away. Large masses of igneous rocks and broad streams of vitrified lava bear mute testi-

mony of the change, when, by some mighty subterranean force, the tumultuous sea was rolled back from its pristine bed and, in its stead, lofty mountains lifted their bald heads above the surrounding desolation, and stand to-day as they have stood in massive grandeur ever since the ancient days of their upheaval.

The first half of the book is taken up with an interesting description of ranch life. These chapters are followed by one on *Canyon Echoes,* which, naturally, is mostly taken up with "echoes" from the Grand Canyon. In dealing with the geology of these canyons Dr. Munk criticises the generally accepted theory as to their formation. His views, however, are based on insufficient observation of the present process of erosion in these canyons and a lack of knowledge of river erosion.

The chapter on *Meteorite Mountain* is full of interest and is of special value because, as the author says, it has not received its share of attention among the wonders of Arizona.

The most interesting portion of the book to our readers will be the chapter on *The Cliff Dwellings* and *The Moqui Indians.* He believes that the ruins of the cliff dwellers are "not less than 400 years old and are, in all probability, much older," which is about as much satisfaction as any writer has yet been able to give us.

Concerning the abandonment of the region around the Casa Grande ruins he says:

> Just how ancient these works are might be difficult to prove, but they are certainly not modern. The evidence denotes that they have existed a long time. Where the water in a canal flowed over solid rock the rock has been much worn. Portions of the old ditches are filled with lava and houses lie buried in the vitreous flood. It is certain that the country was inhabited prior to the last lava flow, whether that event occurred hundreds or thousands of years ago.
>
> To affirm that the cliff dwellers were driven from their strongholds and dispersed by force is pure fiction; nor is there any evidence to support such a theory. That they had enemies no one doubts, but, being in possession of an impregnable position where one man could successfully withstand a thousand, to surrender would have been base cowardice, and weakness was not a characteristic of the cliff dwellers.

The volume is very readable and attractive, giving a good idea of the scenery, climate, and people of Arizona, and should stimulate an interest in that section of our country and its priceless antiquities as well as its natural scenery and healthful climate.

A GUIDE TO FORT ANCIENT*

This pamphlet of 34 pages, with a number of illustrations and a map, gives the location of the special points of interest at or near Fort Ancient, Ohio, together with notices of the finds made, and also the location of former cities which have been obliterated by the plowshare.

**A Guide to Fort Ancient,* with map, sketch, and illustrations, by W. C. Tichenor, Dayton, Ohio.

EDITORIAL NOTES

REPRODUCTION OF FACSIMILES:—An International Congress for the reproduction of facsimiles of valuable historical manuscripts is to be held on August 21 to 23 in connection with the exhibition at Liege. The librarian of Brussels University, M. Sury, intends to bring forward proposals for the establishment of national bureaus and a central bureau in Brussels; while M. Gaillard, the head of the Belgian archivists, will deal with the importance of erecting a museum in connection with the chief State archives, but in a separate building, to minimize the risk from fire.

A BABYLONIAN INSCRIPTION:—Among the cuneiform texts from Babylonian Tablets in the British Museum is one from a cone inscribed with the name of Libbit-Ishtar, which records the building by him of a temple in honor of the goddess whose name forms part of his. He describes himself as "Shepherd of Nippur, governor of Ur, patron of Eridu, lord of Larsam, king of Isin, and king of Sumer and Accad," which leaves some doubt in one's mind as to whether the ruler in question was really supreme over more than the city of Isin—a town which has not yet been identified—or whether the protocol of these early kings was as mystical as that of the Egyptian Pharaohs. * * * These texts constitute our only authorities for the history of Babylonia for a period of nearly 2,000 years, while a comparison of them illustrates the development of the plainly cuneiform script of later times from the semi-pictorial forms used by the Sumerian scribes.—*Athenaeum,* London.

ANCIENT INDIAN VILLAGE SITE:—Mr. R. N. Penny, of Riverhead, Long Island, believes that he has discovered an ancient Indian village in a thick wood near Aquebogue. Mr. Penny says that undoubtedly the village he has found dates back long prior to the discovery of America by Columbus.

The village is some distance inland from Peconic Bay, and is situated west of the west branch of Steeple Church Creek and between that stream and a large tributary of the Peconic River. It was discovered quite by accident. Mr. Penny says that he has been in that locality hundreds of times during his life as boy and man, and many others have passed that way, but no one seems ever to have come across that exact spot deep in the heart of the forest.

The village is described as of 12-wigwam size. The cooking holes are plainly discernible, and there is the faint outline of what was the corn or maize field of the villagers. One proof of the extreme age of the village is found in the oyster shells which the inhabitants threw away. Shells are known to last hundreds of years and remain sound and brittle for ages, but shells found in this old village are decayed.

S. Terry Hudson, a well-known antiquarian of Riverhead, and George A. Brown, principal of the Riverhead High School, who has made a study of the geology of Long Island, agree with the discoverer of this ancient village as to its extreme age. They point to the fact that Indians usually established their villages on the bank of or near some stream, but it is well known that no tributary to bay or river or creek has flowed near this spot in hundreds of years.

SINAITIC PENINSULAR EXCAVATIONS:—The chief interest in the University College (England) exhibition centers around the results of Prof. Flinders Petrie's Sinaitic peninsular excavations, made in the turquoise

mines of Waxmoaghaia and Sarabit El Khadem and the latter's temple. The oldest monument group, the King of Mersekha smiting a captive sheikh, is assigned to the I Dynasty, about 4600 B. C. There are also sculptures and inscriptions, which are assigned to 2500 B. C.

An interesting feature of Sarabit El Khadem is the evidence that it was Semitic and not Egyptian worship which was practiced in the whole region. Scattered pilgrim shelters usually contained a Bethel stone, some of which have Egyptian inscriptions. Here the pilgrims came for oracular dreams. This special feature of semitic worship was quite unknown in Egypt.

The temple of Sarabit El Khadem was originally the sacred cave of the goddess Pathos. It must have existed in the III Dynasty, nearly 7,000 years ago. One peculiar un-Egyptian feature of it was two small courts, each with a stone basin for purification. This characteristic feature of every Mohammedan mosque must have existed in Syrian worship 15 centuries before Christ.

The discovery of the greatest antiquity is a collection of flints used by the Bedouins in working turquoise out of sandstone.

MANO PANTEA:—Mr. F. T. Elworthy read a paper [before the Society of Antiquaries, London] on the "Mano Pantea," or so-called "Votive Hand," and exhibited two typical specimens, recently found in excavations at Tusculum and Gaeta, which he believes to be the only ones at present in a private collection, though many are to be seen in the British Museum and other European museums. The peculiar features of these vestiges of ancient Rome are (a) All, without exception, are of the same material—bronze. (b) Every one represents the same peculiar manual gesture, a fact of great importance, being precisely that used in the Latin Church, by the Pope alone, in the act of benediction, and not to be found among the multitudes of others used by gesticulating Neapolitans. (c) Though all are similar—and Mr. Elworthy has brought together ("Horns of Honour") and illustrated a large number—no two are alike, which shows they were designed and modeled separately (d) Notwithstanding the great variety of symbols sacred to the gods embossed upon them, no Mano Pantea is without a serpent, often the most important object upon it: an evidence of the inordinate anxiety of the Romans about their health—that, of all the gods they worshiped, Esculapius was never omitted. The age when these remarkable hands were in fashion is limited from 150 B. C. to 150 A. D., and they are thus an object lesson in the well-known adoption of Egyptian and Phrygian deities into the Roman pantheon during the early empire. A curious fact is that, though so many are still in existence as to prove them to have been quite common and familiar (one of those exhibited may possibly have belonged to Cicero himself), yet no contemporary author, not even Juvenal, has left any reference to them. The few modern writers who have dealt with the subject have accepted them without question as "votive hands," but beyond one or two special inscriptions there is no sort of evidence that they were ever made to be offered in thanksgiving; on the contrary, evidence all points the other way. Mr. Elworthy contended that they were distinctly domestic accessories, intended to be prophylactic and propitiatory, appealing for protection to powerful deities; that, in fact, they were veritable penates of the houses wherein alone they have been found. As to the original meaning of the special gesture—adopted, like many others, into Christianity—nothing at present can be safely maintained. The only known fact is that it came to Rome with Sabazius, the Phrygian Jove.—*Athenaeum*, London.